System Analysis of the Machine Protection System of a Neutron Source

The ESS Accelerator is a new source for neutron, more powerful than any other existing neutron source today. However, such a powerful machine needs a Machine Protection System (MPS). It registers if the proton beam in the accelerator is within certain parameters or not, in order to protect components and equipment from damage.

In this project, a simple exemplary version of the MPS is to be recreated in a modelling program. Furthermore, the method must be able to regard several failure behaviours as well within a time limit. First it has to be decided which modelling program is the best choice, which one is able to fulfill most if not all requirements. Then it has to be looked into if the failure behaviour can be modelled. Since this is the case, these failure behaviours are combined for a single component and tested. This test is also successful, so the components are used to create the entire system.

In the end, a modelling program, the REALIST Editor working with petri nets, is found to be able to fulfill all the requirements. It can simulate all failure behaviours and the system can function within the time limit.